United States Patent [19]

Morii et al.

[11] **Patent Number: 4,821,659**

[45] **Date of Patent: Apr. 18, 1989**

[54] **WORKPIECE HOLDING DEVICE FOR A SEWING MACHINE**

[75] Inventors: **Satoshi Morii**, Nagoya; **Kunihiko Murata**, Tsushima; **Hiroyuki Mitsui**, Kasugai, all of Japan

[73] Assignee: **Brother Kogyo Kabushiki Kaisha**, Aichi, Japan

[21] Appl. No.: **188,174**

[22] Filed: **Apr. 26, 1988**

Related U.S. Application Data

[63] Continuation of Ser. No. 125,325, Nov. 25, 1987.

[30] **Foreign Application Priority Data**

Dec. 1, 1986 [JP] Japan 61-185292

[51] **Int. Cl.**[4] **D05B 21/00**; D05B 35/00

[52] **U.S. Cl.** **112/121.15**; 112/147; 223/38

[58] **Field of Search** 112/121.15, 121.12, 112/121.11, 147; 223/38; 292/302; 402/DIG. 4

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,673,666	3/1954	Silverman	223/38
3,552,336	1/1971	Brandriff et al.	112/121.15
3,667,411	6/1972	Perlino .	
3,930,454	1/1976	Perlino	223/38 X
4,463,697	8/1984	Vogt et al.	112/147 X

FOREIGN PATENT DOCUMENTS

60-195686	12/1985	Japan .
1534816	12/1978	United Kingdom .
2032990	5/1980	United Kingdom .
2038923	7/1980	United Kingdom .

Primary Examiner—H. Hampton Hunter

Attorney, Agent, or Firm—Parkhurst, Oliff & Berridge

[57] **ABSTRACT**

A workpiece holding device for a sewing machine is disclosed. When a workpiece holder is connected to a supporter, a connecting rod having a peripheral groove and extending from the workpiece holder is inserted into a horizontal hole formed in the supporter. In this case, the peripheral groove of the connecting rod is positioned to communicate with a vertical hole formed in the supporter. A piston rod slidably provided in the vertical hole is actuated by an air cylinder mechanism to be engaged with the peripheral groove of the connecting rod. In order to firmly engage the connecting rod and the piston rod, spring mechanism is also provided in addition to the air cylinder mechanism. Thus, the workpiece holder can be fixedly connected to the supporter, and easily detached from the supporter without tools and troublesome operations.

4 Claims, 5 Drawing Sheets

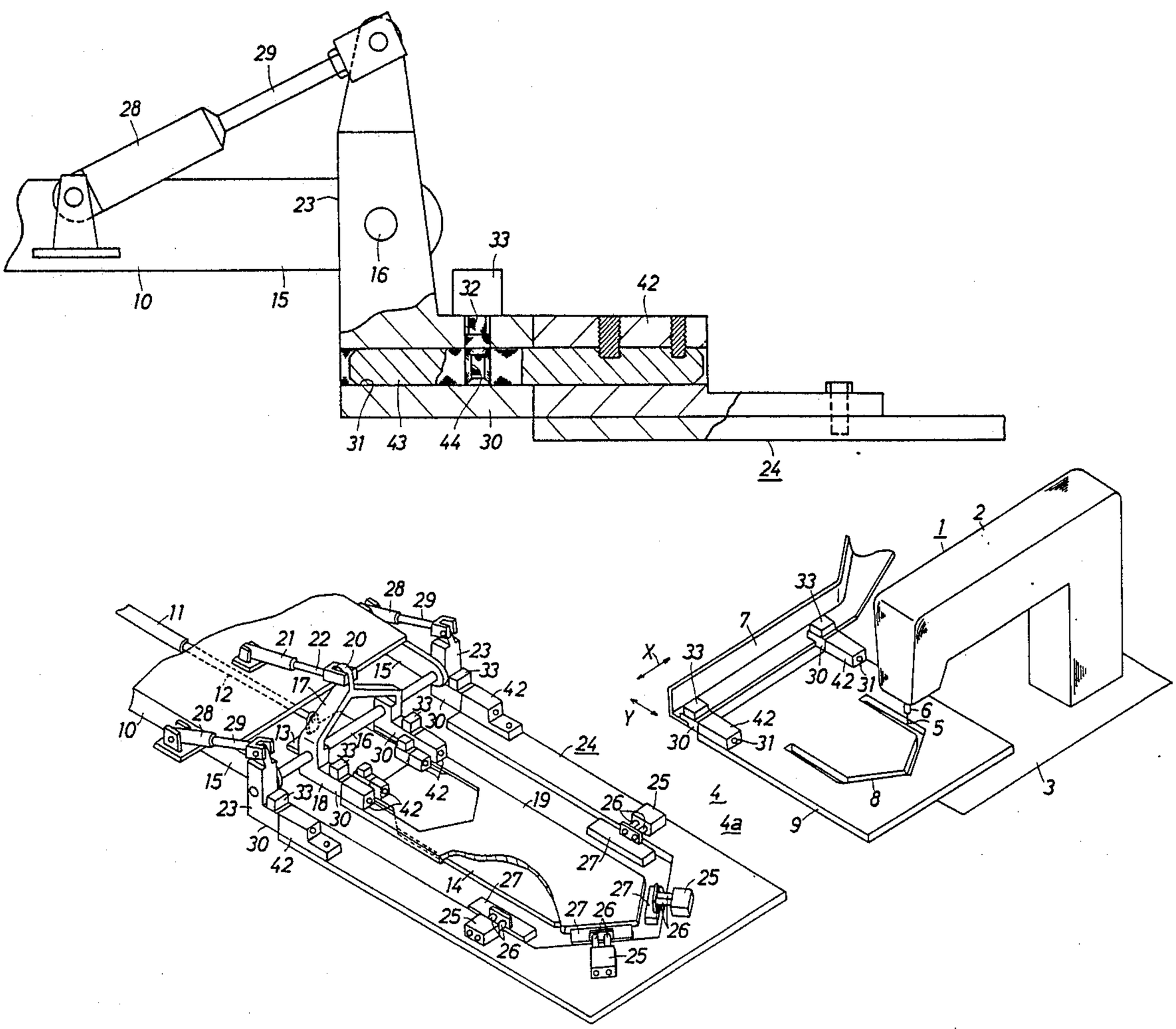


FIG. 1

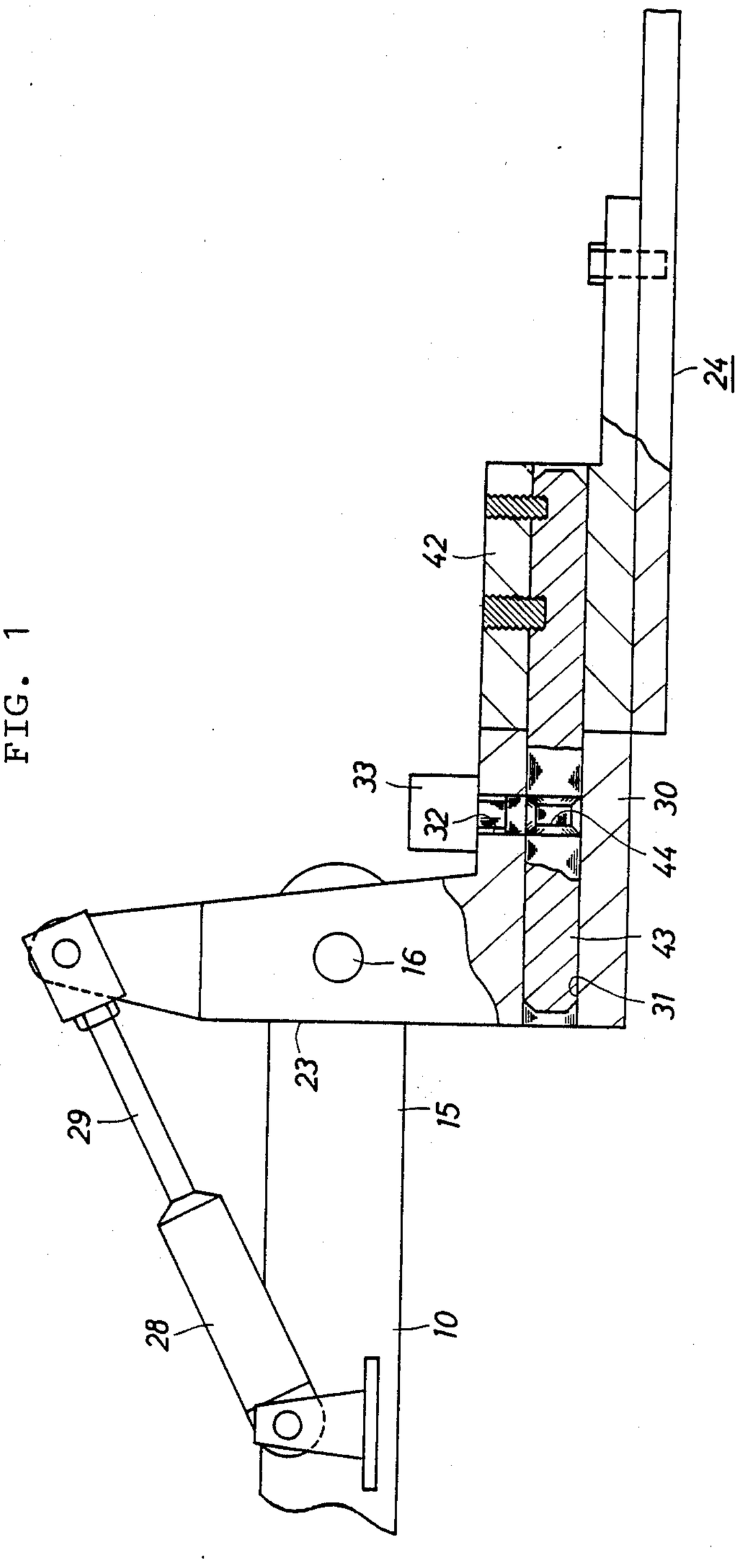


FIG. 2

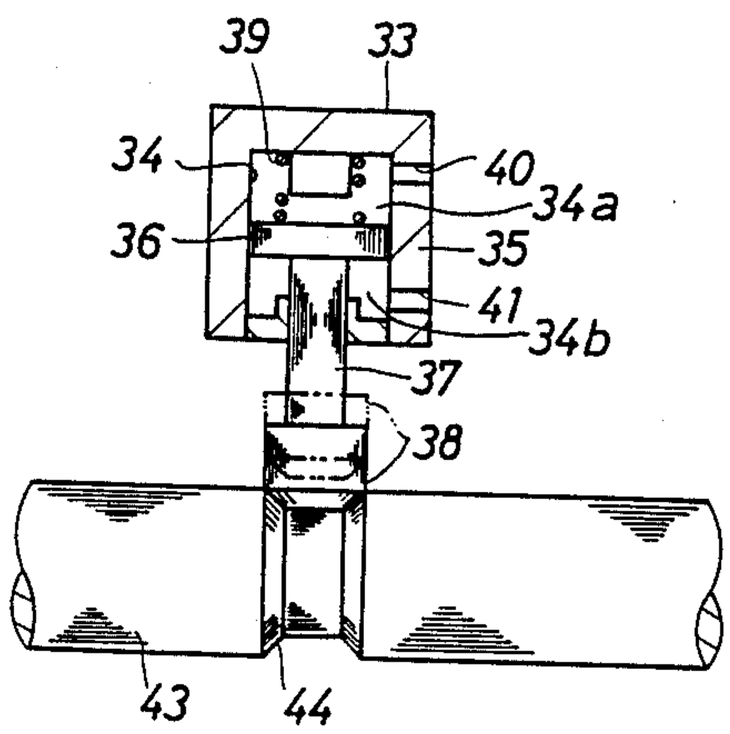


FIG. 3

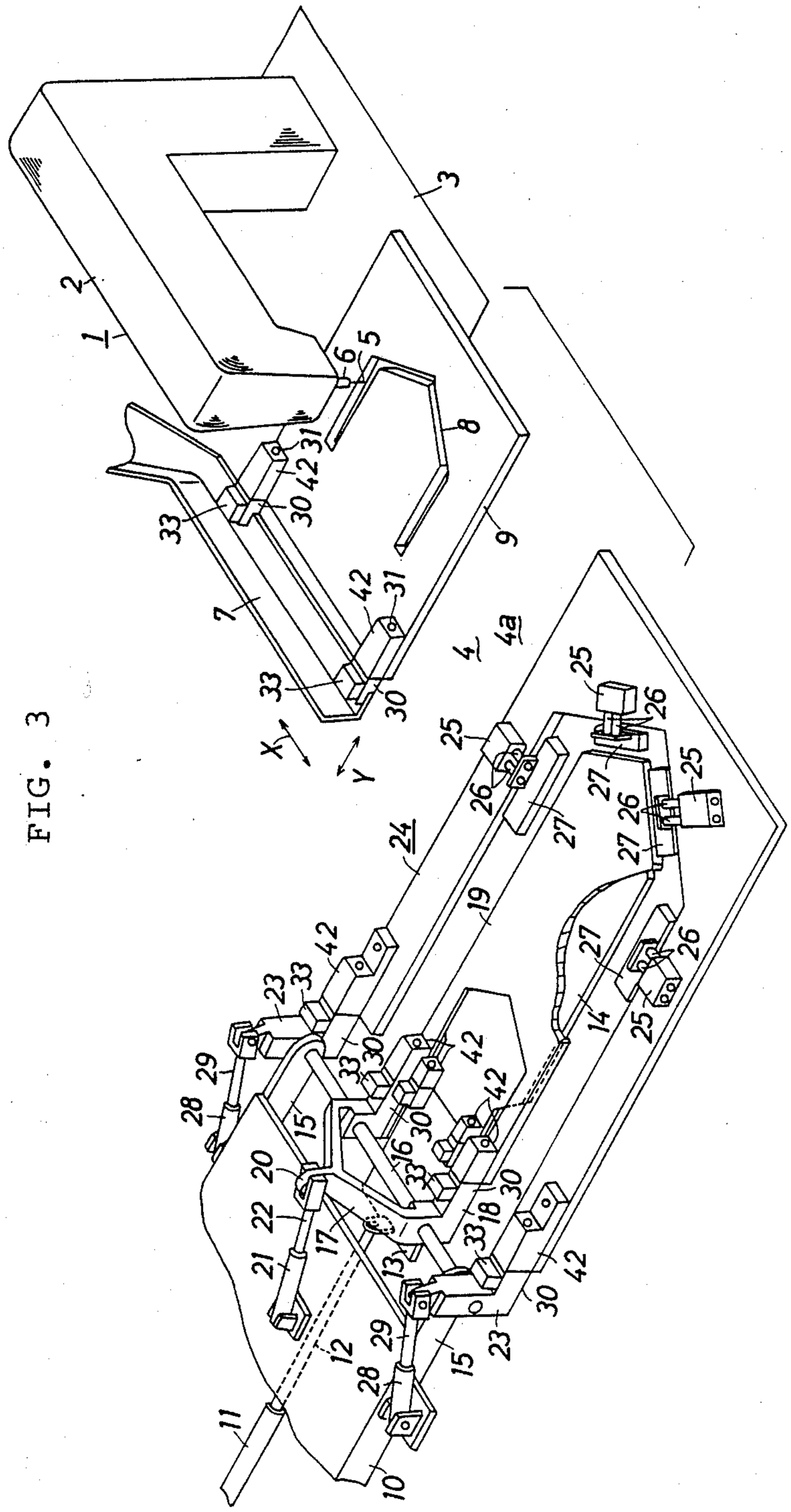

1
2
3
4
4a
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
33
42
X
Y

FIG. 4A

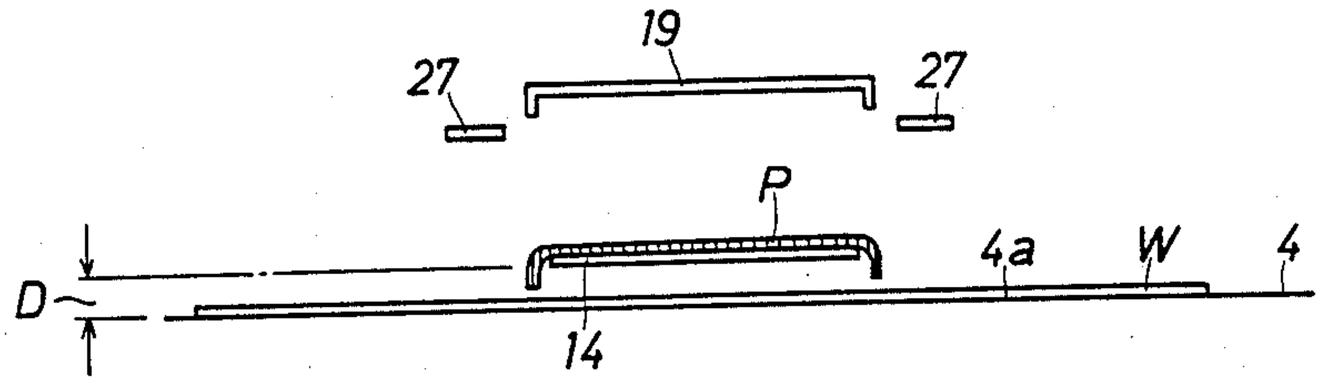


FIG. 4B

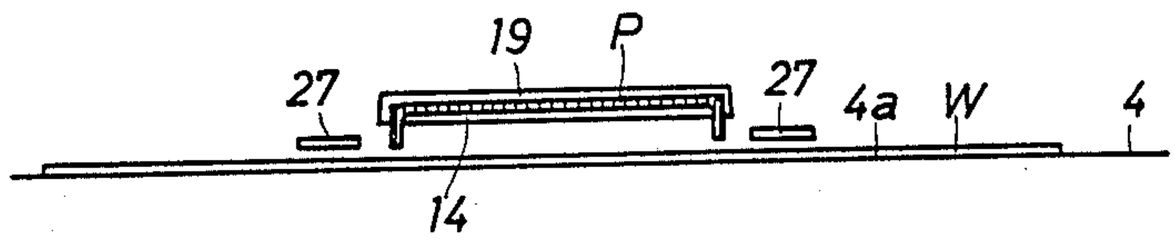


FIG. 4C

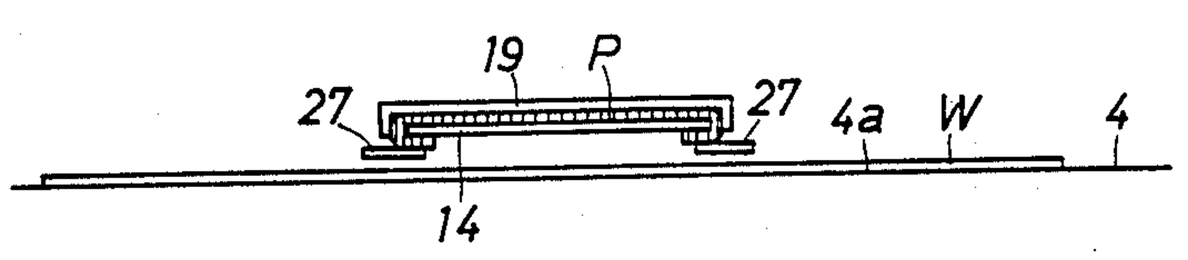


FIG. 4D

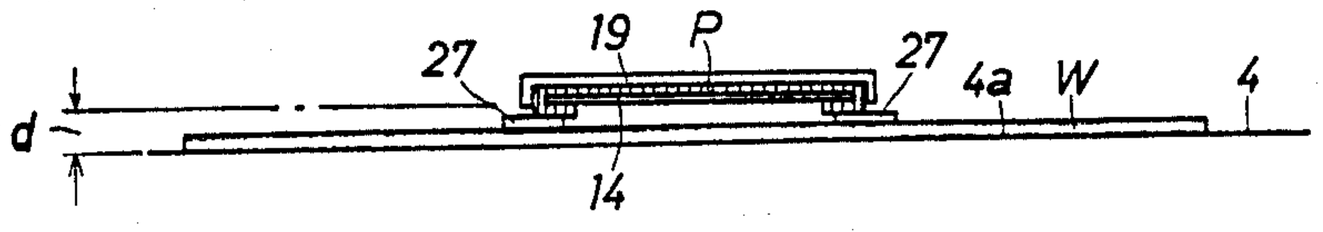


FIG. 4E

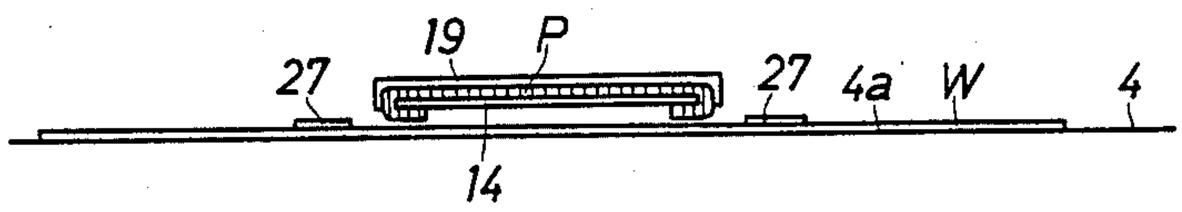


FIG. 4F

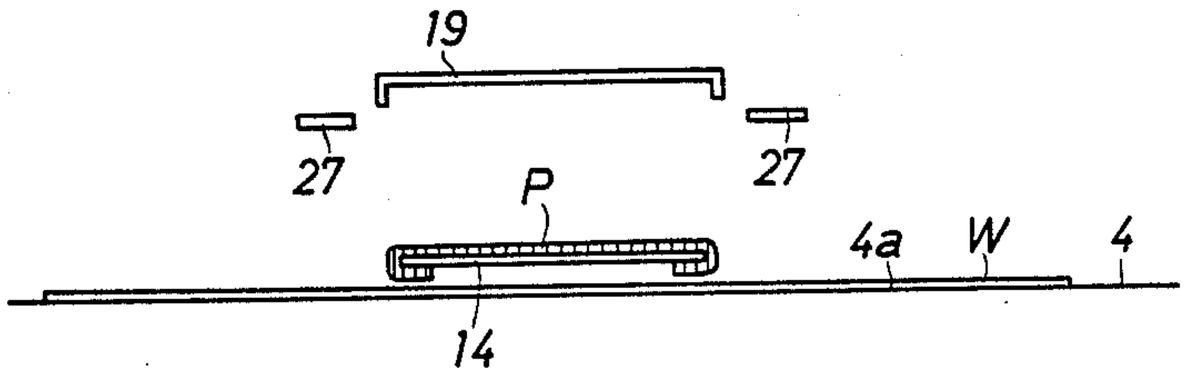


FIG. 4G

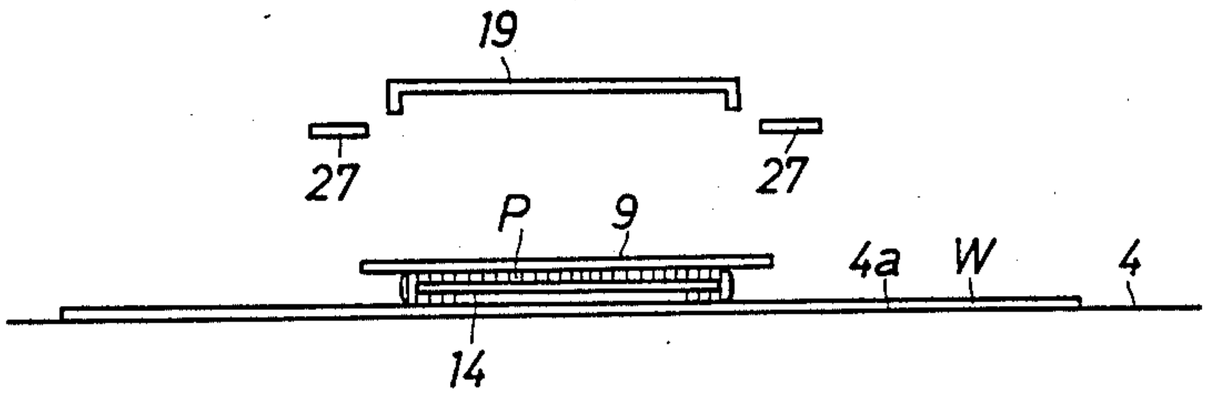
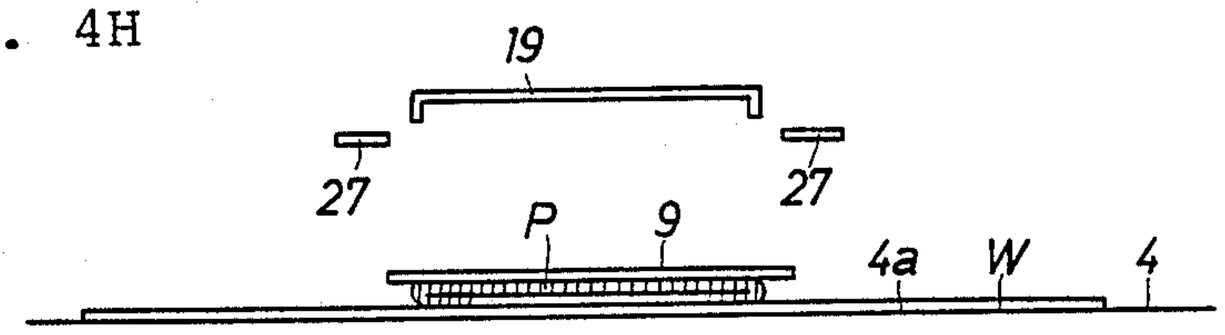


FIG. 4H



WORKPIECE HOLDING DEVICE FOR A SEWING MACHINE

This is a continuation of application Ser. No. 125,325 filed Nov. 25, 1987.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to a workpiece holding device, especially to a cloth holders for a sewing machine.

2. Prior Art

It is known that pocket edge folding operation is executed as follows in a prior art device.

In response to various contour of a patch pocket, a plurality of workpiece holding plates such as gage plates, holding plates and folder base plates are optionally coordinated and then connected to a supporting member of a pocket folding device. After the patch pocket is set on the gage plate, the holding plate is put on the gage plate with the patch pocket between, so that the peripheral edge of the patch pocket is folded downward. Then, folders are slidably inserted along the back surface of the gage plate from the outside, thereby the peripheral edge of the patch pocket is folded back.

In such a device, since the holding plates are each fixed to the supporting member with bolts (for example, see U.S. Pat. No. 3,667,411), a tool such as a screwdriver and troublesome operation are required to exchange the holding plates. Moreover, the bolts are apt to loosen during the folding operation, resulting in deteriorating the accuracy of holding operation.

A holding device for holding a cloth is disclosed in the Japanese published unexamined utility model application No. 60-195686 in which a cloth holding plate is attached to a supporting member with an easy connecting mechanism. But in this holding device, the supporting member does not move upward nor downward in relation to the table of the machine. Further, the connecting mechanism is different from that of the present invention hereinunder described.

SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a workpiece holding device for a sewing machine in which the holding plates and gage plates can be easily exchanged and fixedly connected to the supporting member of the holding device.

To achieve this and other objects, the present invention has a constitution set forth. Namely, a workpiece holding device for a sewing machine which is equipped with a table, a supporting member movably supported on the table in upward and downward movements, actuating means for actuating the supporting member, a workpiece holding plate and connecting mechanism for detachably connecting the workpiece holding plate with the supporting member, is characterized in that the connecting mechanism includes:

at least one connecting rod provided on either one of the supporting member or the holding plate;

at least one hole formed in the other side of the supporting member or the holding plate for slidably receiving the connecting rod along an axis thereof;

a latch means for latching said connecting rod at an inserted position.

The latch means are embodied by a stepped portion formed on the connecting rod and the engaging member. The stepped portion may be a protrusion or a groove.

BRIEF DESCRIPTION OF DRAWINGS

By way of example and to make the description more clear, reference is made to the accompanying drawings in which:

FIG. **1** is a sectional view illustrating a connecting mechanism of a workpiece holding device for detachably connecting a workpiece holding plate with a supporting member;

FIG. **2** is a sectional view of a connecting rod and an air cylinder of the present invention;

FIG. **3** is a perspective view of a pocket folding device and a sewing machine of the present invention; and

FIGS. **4A**, **4B**, **4C**, **4D**, **4E**, **4F**, **4G** and **4H** illustrate steps of the process for folding the peripheral edge of a patch pocket by the folding device of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment of the present invention is set forth with reference to the attached drawings.

As shown in FIG. **3**, a sewing machine **1** includes a machine arm **2** and a machine bed **3**. The machine bed **3** is positioned to flush with the upper surface of a machine table **4**. A needle bar **6** with a needle **5** at its lower end is attached to the machine arm **1** to be vertically movable. A loop taker (not shown) which cooperates with the needle **5** to form a stitch is installed within the machine bed **3**. A guide arm **7** is provided on the machine table **4** to be movable in both X and Y axes shown in FIG. **3**. A guide plate **9** including a needle guide groove **8** is removably attached to the front part of the guide arm **7**.

As to be explained referring to FIGS. **4A** through **4H**, a cloth W and a patch pocket P to be stitched on the cloth W are held on the machine table **4** by the guide plate **9**. Under such condition, a known stitch forming mechanism is started and the guide plate **9** is moved in X and Y directions so that the needle moves along the needle guide groove **8**. Thus, the patch pocket P is stitched on the cloth W.

The operation for folding the peripheral edge of the patch pocket P is set forth. As shown in FIG. **3**, a supporting member **10** is provided above the machine table **4** to be rotatable around a horizontal axis. An air cylinder **11** including a piston **12** is provided under the supporting member **10**. A gage plate supporter **13** which is attached to the front end of the piston **12** is positioned in the front of the supporting member **10**. A gage plate **14**, on which the patch pocket P is set for determining the contour of the pocket, is removably attached to the gage plate supporter **13**.

Two arms **15** are projecting in parallel from both edges of the front end of the supporting member **10**. The axis **16** is bridged across the arms **15** at a right angle to them. A holding plate supporter **17** is attached to the axis **16** to be rotatable around the axis **16**. Moreover, a holding plate **19** is removably attached by a pair of attaching member **18** which are extending from the supporting member **17**. A connecting head **20** projecting from the center of the upper side of the supporting member **17** is connected to a piston **22** of an air cylinder **21**-which is rotatably attached to the upper surface of the supporting member **10**. The piston **22** functions to pivotally move the holding plate **19** between a prepara-

tory position above the gage plate **14** and an operational position on the gage plate **14**.

Both ends of the axis **16** are supported by a pair of arms **15**. A pair of supporting blocks **23** are pivotally supported by the both ends of the axis **16**. A U-shaped folder base plate **24** is removably attached to the front ends of the supporting blocks **23**. The front end of the holding plate **19** is surrounded by four air cylinders **25** which include pistons **26**. Each of the piston **26** is equipped with a folder **27** which is moved between the operational position under the gage plate **14** and the preparatory position apart from the gage plate **14** by actuating the piston **26**.

On the other hand, the upper end of the supporting blocks **23** and the supporting member **10** are connected by a pair of air cylinders **28** including pistons **29**. The base of the cylinders **28** are pivotally attached to the both sides of the supporting member **10**. The pistons **29** are each connected to the upper end of the blocks **23**.

Set forth is the description of the processes for stitching the patch pocket P onto the cloth W by utilizing the pocket folding device of the present invention and a sewing machine. First, the peripheral edge of the patch pocket P is folded. Namely, the gage plate **14**, the holding plate **19** and the folder base plate **24** are raised with the supporting plate **10** so that the gage plate **14** is set at the preparatory position at a distance D apart from a surface **4***a* of the machine table **4** as shown in FIG. **4**A. Then, the air cylinders **21** and **28** are actuated to raise the folder base plate **24** and the holding plate **19**. Under this condition, the cloth W is put on the table surface **4***a* under the gage plate **14**, and the patch pocket P is put on the gage plate **14**. Next, the air cylinders are actuated to lower the holding plate **19** and the folder base plate **24** so that the holding plate **19** is put on the gage plate **14**. Thus, the peripheral edge of the patch pocket P is folded downward along the contour of the gage plate **14** as shown in FIG. **4**B. After that, the folders **27** are inserted under the gage plate **14** as illustrated in FIG. **4**C by actuating the air cylinders **25** so that the peripheral edge of the patch pocket P is folded back.

Next, as shown in FIG. **4**D, the gage plate **14**, the holding plate **19** and the folder base plate **24** are lowered with the supporting member **10** so that the distance d between the table surface **4***a* of the machine table **4** and the gage plate **14** becomes smaller than the distance D shown in FIG. **4**A. Subsequently, the air cylinders **25** are actuated to return the folders **27** to the preparatory position as shown in FIG. **4**E. Then, the folder base plate **24** and the holding plate **19** are raised by actuating the air cylinders **21** and **28** to keep them away from the patch pocket P as shown in FIG. **4**F.

Under the above-mentioned condition, the guide plate **9** is placed on the patch pocket P, and is actuated to depress the patch pocket P with the gage plate **14** onto the cloth W as illustrated in FIG. **4**G. Next, by actuating the piston **12** of the air cylinder **11**, the guide plate **14** is drawn back to be detached from the patch pocket P as shown in FIG. **4**H. Under the condition that the patch pocket P and the cloth W are fixed on the table surface **4***a* by the guide plate **9**, the guide plate **9** is set at the stitching point. Thus, the patch pocket P is stitched on the cloth W by the sewing machine.

Set forth is the explanation for the cooperation of the supporting member including the gage plate supporter **13**, holding plate supporter **17** and the supporting block **23**, and the holding member including the gage plate **14**, holding plate **19** and the folder base plate **24**. For an example, the cooperation of the the supporting block **23** and the folder base plate **24** is explained based on FIG. **1**.

The supporting block **23** and the connector **30** of the guide arm **7** include a horizontal hole **31** which is longitudinally extending in perpendicular to the axis **16**, and a vertical hole **32** communicating with the horizontal hole **31**. A connecting air cylinder **33** is provided on the connector **30**. As shown in FIG. **2**, the connecting air cylinder **33** is composed of a frame **35** including a chamber **34** and a piston rod **37** with a base flange **36** which is movably inserted into the chamber **34**. The chamber **34** is separated into an upper chamber **34***a* and a lower chamber **34***b* by the base flange **36**. A plug **38** is provided at the tip of the piston rod **37**. By actuating the piston rod **37**, the plug **38** is moved up and down through the vertical hole **32** to appear and disappear in the horizontal hole **31**. A spring **39** for pushing the piston rod **37** is provided between the base flange **36** and the inner surface of the chamber **34**. In the side wall of the frame **35**, two air inlets **40** and **41** which are respectively communicating with the upper chamber **34***a* and the lower chamber **34***b* are formed.

As illustrated in FIG. **1**, a connecting rod **43** is attached to a connecting block **42** which is formed at the base of the holding member including the folder base plate **24** and the guide plate **9**. The connecting rod **43** being longitudinally extending at a right angle to the axis **16** is removably inserted into the horizontal hole **31** of the connector **30**. The connecting rod **43** has a groove **44** around its peripheral surface. When the connecting rod **43** is inserted into the horizontal hole **31** of the connector **30**, the peripheral groove **44** is positioned to communicate with the vertical hole **32**. Then, the plug of the piston rod **37** can be engaged with the peripheral groove **44**.

The operation for installing the gage plate **14**, the holding plate **19**, the folder base plate **24** and the guide plate a corresponding to a predetermined contour of the patch pocket P is hereinunder described.

First, air is supplied via the air inlet **41** to the lower chamber **34***b* of the air cylinder **33**, so that the piston rod **37** is pushed up to the preparatory position shown by a two-dot chain line in FIG. **2**. Under such condition, the connecting rod **43** of the gage plate **14**, the holding plate **19**, the folder base plate **24** and the guide plate **19** are each inserted into the horizontal hole **31** of the gage plate supporter **13**, the holding plate supporter **17**, the supporting block **23**, and the guide arm **7**, respectively. Then, the peripheral groove **44** of the connecting rod **43** is positioned to communicate with the vertical hole **32** of the air cylinder **33**. Subsequently, the air supply via the air inlet **41** is stopped and the remaining air in the lower chamber **34***b* is exhausted. At the same time, air is supplied via another air inlet **40** into the upper chamber **34***a*. As a result, the piston rod **37** is pushed down so that the plug **38** is engaged with the peripheral groove **44**. Since the plug **38** and the groove **44** are firmly engaged, the connecting rod **43** hardly disconnects from the connector **30**.

In the present embodiment, the spring **39** is provided between the base flange **36** and the inner surface of the chamber **34** so that the plug **38** is firmly engaged with the peripheral groove **44** by the spring force. Namely, even if the air supply to the chamber **34** is terminated or the pressure within the chamber **34** is changed, the plug **38** is not easily released from the peripheral groove **44**.

After the plug **38** is engaged with the groove **44**, the cloth W and the patch pocket P are set. By operating the sewing machine and the folding device, the patch pocket P is automatically stitched on the cloth W.

On the other hand, when a patch pocket having a different contour is stitched on the cloth W, each element of the folding device, i.e., the gage plate **14**, the holding plate **19**, the folder base plate **24** and the guide plate **9** must be exchanged. In this case, the air supply via the air inlet **40** is stopped and the remaining air in the upper chamber **34***a* is exhausted. At the same time, air is supplied to the lower chamber **34***b* via the air inlet **41**. Thus, the piston **37** is returned to the preparatory position shown by a two-dot chain line in FIG. **2**, and the plug **38** is disconnected from the peripheral groove **44**. Thus, the gage plate **14**, the holding plate **19**, the folder base plate **24** and the guide plate **9** are easily detached by removing the connecting rod **43** from the horizontal hole **31**.

In this embodiment, since the connecting rod **43** is firmly inserted into the horizontal hole **31**, the gage plate **14**, the holding plate **19** and the folder base plate **24** never become unstable while they are raised or lowered between the preparatory position apart from the table surface **4***a* and the operational position on the table surface **4***a*.

While the invention has been practically shown and described with reference to preferred embodiments, it will be understood by those skilled in the art that various other modifications may be made without departing from the spirit and scope of the invention. For example, the connecting rod **43** can be provided to the supporting member, and also it is possible to provide the horizontal hole **31** and the connecting air cylinder **33** to the holding plate. Moreover, the present invention can be embodied by a workpiece holder for a sewing machine utilized for embroidering figure patterns or stitching an applique or the like onto a cloth.

Further, the combination of the plug **38** and the groove **44** of the connecting rod **43** as shown in FIG. **3** is replaced by any other combination that can hold the rod **43** firmly. For example, a protrusion is placed on the peripheral surface of the connecting rod **43** and the plug **38** is forked to hold the protrusion. Another example is a key hole provided on the connecting rod **43** and a key in place of the plug **38**. Further example is a slit cut formed in the connecting rod **43** and an engaging plate to be fitted into the slit. Such engaging mechanism and other mechanism are included in the stepped portion on the connecting rod **43** and the engaging member as claimed in the following claims.

What is claimed is:

1. A workpiece holding device for a sewing machine comprising a table, a supporting member movably supported on the table in upward and downward movements, actuating means for actuating the supporting member, a workpiece holding plate and connecting mechanism for detachably connecting the workpiece holding plate with the supporting member, characterized in that said connecting mechanism comprises;

at least one connecting rod provided on either one of said supporting member or said holding plate;

at least one hole formed in the other of said supporting member or said holding plate for slidably receiving the connecting rod along an axis thereof;

a latch means for latching said connecting rod at an inserted position, said latch means including an engaging portion formed on said connecting rod, an engaging member for engaging with the engaging portion, and an actuating means for actuating said engaging member to engage with said engaging portion.

2. A workpiece holding device for a sewing machine comprising a table, a supporting member movably supported on the table in upward and downward movements, actuating means. for actuating the supporting member, a workpiece holding plate and connecting mechanism for detachably connecting the workpiece holding plate with the supporting member, characterized in that said connecting mechanism comprises;

a plurality of connecting rods provided on said workpiece holding plate and horizontally extending therefrom;

a groove formed on each peripheral surface of the connecting rods;

a plurality of horizontal holes formed in said supporting member each for slidably receiving each of the connecting rods along an axis thereof;

a plurality of engaging members movably supported on the supporting member each for engaging with the groove of the connecting rod inserted into the horizontal hole; and

a plurality of actuating means for actuating the engaging members.

3. A workpiece holding device for a sewing machine according to claim **2**, wherein said groove includes a peripheral notch; and said engaging member is slidably supported in a vertical hole which formed in said supporting member so as to intersect to said horizontal hole.

4. A workpiece holding device for a sewing machine according to claim **3**, wherein said actuating means includes an air cylinder; and said engaging member is a piston rod of the air cylinder.

* * * * *